

Q U A N T A

THE NEWSLETTER OF THE INDEPENDENT QL USERS' GROUP

VOLUME 1 ISSUE 4

MAY 1984

CONTENTS

1. Information on the Group
2. Editorial
2. The QL - a brief review
3. Members' letters
11. First impressions of the QL
15. MC68000 signed 48 X 48 bit multiply
18. Sinclair authorise us to publish ROM disassembly
19. Conversion of a 16 in. Grundig colour TV to RGB operation
21. Book review - The Sinclair QL Companion, by Boris Allan

INFORMATION ON THE GROUP

Membership of the Group is by subscription to the Newsletter, which is published monthly. Membership details are obtainable from the Group Secretary. Membership of the Group is open to anyone with an interest in the Sinclair QL microcomputer.

Members requiring assistance with problems related to the QL may call the Secretary. An attempt will be made to put them in touch with a member who can help with the problem.

Workshops will be arranged from time to time in various parts of the country.

A Membership list is obtainable from the Secretary.

Please send all contributions for the Newsletter to the Editor.

Acting Chairman
and Newsletter Editor:-

Leon Heller,
8 Morris Walk,
Newport Pagnell,
Bucks. MK16 8QD.
Tel: (0908) 613004

Acting Secretary and
Newsletter Publisher:-

Brian Pain,
24 Oxford Street,
Stony Stratford,
Milton Keynes.
Tel: (0908) 564271

SINCLAIR, QL, QDOS, QLUB and ZX Microdrive are Trade Marks of SINCLAIR Research Ltd.

Quill, Abacus, Archive and Easel are Trade Marks of PSION Ltd.

Continued from Page 2

I didn't like the keyboard very much. The keys feel rather spongy and the click occurs when the key is released, which I found slightly disconcerting. The ENTER key was stiff unless pressed in the centre. Sinclair have made a very serious mistake in not providing "n-key rollover". That is, if you have two or more keys depressed, depressing another key will cause the key stroke to be missed. This will not matter to most of us who are not touch typists, but could cause fast typists to lose characters. Even my old TRS-80 Model I has n-key rollover! This can easily be rectified in software. I often keep the shift key down when pressing the space bar. The QL will not register a space character in this situation.

Go to Page 3.

EDITORIAL

Sinclair have started delivering QLs at last! Before you start getting excited. I should warn you that the machine is practically unusable if you wish to write your own programs, due to the bugs in the current implementation of SuperBASIC.

I have had to hold over quite a lot of material that has been sent in, for inclusion in the next issue. I would like to put it in this issue, but we have not got enough members to justify the cost of going above 24 pages.

The Cambridge workshop, like the Swindon meeting, was very poorly attended - only five members turned up!

Leon Heller

THE QL - A BRIEF REVIEW

I managed to get my hands on a QL yesterday (Friday 11 May) and found it a rather underwhelming experience. Frankly, Sinclair's latest offering was a considerable disappointment.

I just had an afternoon on the machine, so I was only able to have a quick look at the BASIC, and try out Quill, the word processor program developed by Psion. Luckily, the owners of the machine already had the provisional manual, as Sinclair are not supplying any documentation on the BASIC, at present!

SuperBASIC

The first problem I found was that it was extremely slow. A simple FOR-NEXT loop took nearly twice as long as the same program running on the Tandy Model II on which I am writing this article!

The next program I tried, a program to calculate factorials using a recursive procedure, caused the system to lock up completely, necessitating a reset, which deleted the program from memory. It looks as though the current SuperBASIC implementation does not handle the stack properly.

One member, Jeremy San, who has had a QL for several days now, has found numerous bugs, and has told Sinclair about them. Sinclair are sending him a new ROM to try out.

Quill

I found the Quill word Processor an adequate piece of software, but nothing special. It is considerably less powerful than Wordstar, but somewhat easier to use. Like the BASIC, I found it rather slow. The cursor movement seemed very leisurely, and due to the slowness of the Microdrives, scrolling through a large text file was extremely tedious, as every now and then, the Microdrive was accessed, presumably to save the buffer contents, and everything stopped. It is probably adequate for letter writing, but I would hate to use it to write a book.

The display was rather poor, although direct video input was being employed, and the colours kept changing while I was using the BASIC.

Continued from Page 1

A member has just rung to tell me about his experiences with his QL. He also finds the machine slow, and since his Microdrives do not seem to be working properly, he is thinking of returning the system and asking for his money back!

To summarise my initial impressions; not a quantum leap, but a retrograde step!

My thanks to Richard Brockbank and Simon Dally, of Century Communications Ltd., for letting me use their machine.

Leon Heller

MEMBERS' LETTERS

May I firstly congratulate you on the production of an eminently readable, syntactically viable and extremely well-organised missive. If your supercilious correspondent from Bury-St-Edmunds had taken the trouble to investigate other "organisations of this type" he would have discovered that yours ranks high indeed! And for him to suggest that his was not a "carping criticism" was an exercise in paramount self-deception and possibly the most disingenuous paragraph in his entire arrogant tirade.

However, on to sensible things. I, like many others, am searching for a cheap colour monitor that will sustain 80 columns clearly and cleanly. I have written to JVC, Reynolds (RGB Grundig conversion) and Microvitec (who did not bother replying). I would welcome and utilise a comparison article. (I'd be happy to write it myself if I could get to see the various monitors simultaneously).

I am also interested in modems but am depressingly uninformed! Perhaps a short piece on the Minor Miracles machine could be mounted with special reference to software and leads.

Finally. could you be a little more simplistic in your approach to the intricacies of the MC68008, please. I'm just a beginner, as I suspect others are, and my professional qualifications are all non-science!

Mary thanks for an extremely worthwhile work.

Ian G. Williams,
82 Tarbock Road,
Huyton,
Liverpool L36 5TQ.

p.s. We shouldn't criticise Clive too much - I cancelled my BBC B after waiting six months for an order that was fraught with total dishonesty at Acorn!

/* Thanks for the vote of confidence! Details of a DIY RGB conversion for a Grundig TV are in this issue. One of our members, Jeremy San, has a Minor Miracles modem. As soon as he gets his QL I'll try to get an article out of him.

*/

We just have received the first two numbers of your Quanta magazine. They are very interesting and correspond exactly to what we awaited. We will of course continue to be member of the IQLUG and will be very pleased to send you our own newsletter on the QL.

Club Micro-Europe is the official Sinclair Club for Belgium, Luxemburg and France. We have, in federation with three french organisations, more or less 800 members. Club MICRO-QL was founded to welcome QL interested members, Micro-Europe being reserved for ZX-81 and Spectrums. We have decided to make two interdependent clubs because the machines are fairly different and touch different layers of users.

Thanks for your interest. We would be pleased if you could publish our name and address in your magazine.

All the best for the future,

R. Betz,
President,
Club Micro-Europe,
Chemin du Moulin,
B-1328 Ohain,
Belgium.

I see in the current PCW you have started something unpronounceable for the QL users - a good idea, even better when QL's start being delivered.

I'm put down for one, and patiently await the happy day. I see too that you ran the Tandy Users' Group, or still do perhaps. I own and use a Tandy Model 4, and would welcome news of such a group. I'm not at all happy with Tandy's attitude to the customer, and while I think I chose correctly on the hardware, their software, still largely to be run on Model III mode, seems to not be properly supportive.

I'm hoping through suitable modems to be able to use Tandy 4 + QL, and if anybody is likely to be able to advise on that, it must surely be you !

John Arthur

I do not own a Sinclair QL, microcomputer, of course, but I am very interested in it as a result of what I have read about it so far. I think the best way to establish whether the QL will be suitable for my purposes - recording and manipulating genealogical and financial investment data - is to take your magazine and to ask your advice at a later date.

D. J. Gill

Firstly, many thanks for my first 3 copies of "QUANTA", which I enjoyed reading - particularly because it is reassuring to find many other potential customers of "QL"s in the queue the same as me. I am lucky, I suppose, in having arranged to pay by Barclay-card.

I enclose some correspondence between myself and SINCLAIR which was basically a waste of time and got me no information whatsoever. I have since telephoned the "QL" enquiry number 3 times in the hope of getting a provisional user's manual and/ or details of the QL operating system, but have had no success. Therefore I am delighted to hear that manuals are available albeit at the price of £25. Could IQLUG invest in a manual and disclose details of :

a) Operating system entry points and what they can be used for. In particular whether the Supervisor Mode of the 68008 can be entered so that programs can be debugged using the Trace facility.

b) The interaction between SuperBASIC and QDOS. How are parallel tasks executed? How is data sent from one task to another? Can parallel tasks written entirely in machine code be executed without intervention of SuperBASIC?

c) The commands / QDOS entry points for operating peripheral devices, such as the microdrives and the network interfaces

When I get my hands on a QL I have the means to very rapidly produce a disassembled listing of its firmware, and can also produce trace dumps of program execution. However, I only wish this information to become of general use to QL users, and obviously don't want to incur the wrath of the SINCLAIR IPU. Have you received any comment from them on the state of affairs regarding printing listings of disassembled firmware. Perhaps if they don't like full listings it will be possible to work out which bits are useful to QL users, and just publish those.

I don't yet have access to a 68000 assembler, and I noted that at your workshop on 28th April, Jeremy San will be making available an assembler written in BASIC. Could I beg borrow or buy a copy of this program on an Intel DD 8" diskette (ISIS formatted)? I can send a suitably formatted disk if required. Alternatively, I can set up a Modem link via a Datel 13A and suck a copy from anyone with compatible equipment.

I have a 48 x 48 bit multiply routine hand written at present (and obviously untested) which you can have if you want it - it should produce a 96 bit product in 0.2 ms at an 8 MHz clock rate on the 68008. I leave it to you to see if it works - I enclose a copy of the commented hand written listing.

Half written is a 68000 disassembler (again hand written in assembler at present). The disassembler should be extremely compact because the first 16 bit word is processed entirely via look up tables, with a few subroutines mopping up the "op-mode" fields and extended instruction words. You have declared an interest in producing a monitor/ debug program - how about a joint venture where I supply the disassembler, to work with it?

There seems to be little point in anyone bothering to write a 68000 assembler in machine code when SINCLAIR declare they have one under way ... or have they? Could IQLUG find out how far they have got and when it will be on the market?

I bought the book "68000 Assembly Language Programming" by Kane, Hawkins and Leventhal which I notice you have recommended. I hope potential assembly language programmers are not put off by the price because the book is very interesting, well written, and includes lots of program examples and exercises for the reader to try. Only 1/4 of the 270 pages are taken up with presenting the 68000 instruction set, and the rest of the book deals with programming techniques starting at the basic level of "what is an assembler, linker, loader etc ?" and going on to give very useful and practical guidelines for general software development. Anyone contemplating assembly language programming for the 68000 should read this book.

Thanks again to you and Brian Pain for going to the trouble of organizing an independent QL users group. I was pleasantly surprised to find IQLUB is not a profit-making venture, and will be glad to offer any help that I can. If you have ideas for articles but need help in writing them, give me a ring.

Rob Skerratt,
"Betheden",
129 Melford Way,
Cavendish Park,
Felixstowe,
Suffolk IP11 8UH.

I don't yet have a QL, but I intend to get one to program to handle Hebrew.

David F. Pennant.
Kent Cottage,
4 Clyde Road,
Redland,
Bristol.

It might interest you to know that we will be running QL training courses from June (assuming that we have our machines by then!). The courses will concentrate on the business packages and applications; half a day on each topic. Full details from Owl Computer Training at the address below.

Owl Business and Computer Consultants,
15 Clarkes Spring,
Tring,
Herts. HP23 5QL.
Tel: Tring (044282) 7302

Is anyone interested in writing an 'expert's Guide' to the QL for us? Lotsa money (and fame and things).

Tim Hartnell,
Interface Publications,
9-11 Kensington High Street,
London W8 5NP.

I was interested to read in the April issue of Personal Computer World about your IQLUG and would be grateful for further details.

I am an OAP and insufficiently mentally flexible to be anything other than a fascinated observer of the new technology. I started with a ZX81 and now have a Spectrum, two Microdrives and an Epson FX80 with the Tassword Two word processor.

I as an unashamed admirer of Sir Clive and all his works, despite his inability to launch his new models. I had to wait three to four months for my Spectrum and my compensatory "free gift" was a load of unwanted ZX printer paper. I sent ay order and cheque for my QL at the end of January. It was acknowledged on the 23rd February with a delivery date at the end of June. Mr. Nigel Searle has promised another "free gift" in compensation for lost interest on cheques deposited. I only hope that it will be more useful than the last one!

My main interest in the QL, besides it's advanced technology, is the proper keyboard. My Spectrum' keyboard is most unsatisfactory in design and operation, as the space, full stop and comma frequently fail to function.

PEH WARNER
10 Rosewarne Court,
Hyde Street,
WINCHESTER, S023 7HL.

Dear specialists about the QL Sinclair computer,

we are here some Icelanders enthusiastic about the QL and it's software. Can you give us the answer to the following question:

- How can the QL Quill be accommodated to Icelandic?

1st problem: In Icelandic we use the "dead" comma quite a lot on all vowels except the ö (the same "dead" comma as the French accent aigue).

2nd problem: In Icelandic there are four extra letters in the alphabet (which makes 8 with the lower case): Þþ, Óó, Ðð, Ææ.

3rd problem: Those letters must be placed according to the Icelandic standard keyboard (see fig. below) to perform professional writing and printout



If the club is yet in a position to have any influence on the Sinclair organisation, may I say I think one thing it could be urging right away is that Sinclair should make provision of a Centronics interface a high priority. I have a clear impression that among users with a printer at all who are upgrading from other home computers, the majority - like me - have ones which use Centronics input.

Ian Leslie,
71 Duke's Avenue,
London N10 2PY

I read in the last issue of Personal Computer World that you've already created a QL club, independent of SINCLAIR.

A lot of people in Belgium (and of course in other countries...) are very excited by QL and are awaiting for its distribution outside U.K. I am in this case. I would like to know if your group accept Belgian members and what are the conditions? Could you send me more informations about it?

The marketing of the QL won't probably be effective before the end of the year (in Belgium...). Informations about this product are not very easy to get and that's why I write you. I would be very obliged if you could give me answers to the following questions:

- I heard that SINCLAIR had problem to get 68000 chips. Is it true?

- In U.K., is there a lot of QL already sold? Have you got yourself a QL?

- I don't want to wait too long for the purchasing of my QL and it's impossible to order it from Belgium! Is it possible to go to London (or anywhere else) and buy it? Could you give a me a piece of advice, to get a QL as soon as possible?...

It makes a lot of questions but if you give me some answers, I would be very pleased. Thank you very much for your help.

Christian POELS
10, rue des Bas-Sarts
B-4100 SERAING (BELGIUM)
Phone: (41) 37.16.06

I do not know if you are interested in QL order statistics but if you are my own position is that I posted an order with a cheque for the full price, p&p and QLUB on the 27 Jan 84, had an acknowledgement dated 22 Feb 84 and have heard nothing since!

E G Whitbread
5 Bideford Gardens
ENFIELD Middlesex
EN1 2RP

I Previously owned a Dragon 32, so I know very little of the Sinclair or Spectrum range. I would be grateful if you could tell me if things like Epson printers can be used, or is it best sticking to the Sinclair range.

Ian Unsworth,
34 Exford Avenue,
Worsley Mesnes,
Wigan,
Lancs. WN3 5JZ.

/* It does not look as though Sinclair will be producing a printer for the QL, so an Epson is probably your best bet. I have heard some very favourable comments about a new Canon printer, however. */

I received your three issues of Quanta which made very interesting reading. Do you think you can arrange for a 'binder' so that they can be kept for future reference? Also, an end of year index for cross references.

Ibrahim Nadim,
45 The Banks,
Burbo Way,
Wallasey,
Merseyside L45 3NS.

/* Provided we have sufficient members who want them, we might be able to get a manufacturer to supply suitable binders. Does anyone have any contacts? The index will present no problems - an ideal application for Archive, I'd have thought!

I have not yet received delivery of my QL (end of July, they say!?) but am hoping to get my hands on one while still young enough to enjoy it.

Can you give me any advice about the purchase of monitors for the QL? I understand that there is a QL compatible Cub on the way, but I would be grateful for your views on the best choice of green screen monochrome monitor.

John S. Medhurst,
Ship Performance Group,
School of Marine Technology,
The University of Newcastle upon Tyne.

Can you let me know if the QL has any facility, or any software exists, for a screen dump on a Star Gemini 10X, a Shinwa-CT1, or any other printer.

I have heard a rumour that the QL may be supplied with a cassette interface. I would certainly welcome this - preferably with a selectable baud rate up to at least 4800 baud. Is it true?

Dr. A.C.L. Lee,
6 McCarthy Way
Wokingham,
Berks. RG11 4AU.

/* The QL does not have a screen dump facility built-in, as far as I know. Suitable software should become available very quickly, I'd have thought, if only for the Epson FX80 printer. */

I have just received the first four issues of Quanta, and I am writing to say how impressed I am. Three informative issues about a non-existent machine - congratulations!

I feel that Mr. Hedges' letter in issue 3 needs some response. Firstly, keep the funnies, please. D. H. Lawrence-style serious, intense newsletters I can do without. You are right, computing ought to be fun.

Secondly, a balanced approach to criticism of Sinclair is essential. I seriously believe that he deserves a large amount of it for advertising an advanced, highly attractive-sounding machine which at the time must have been months away from production. Even he must admit that it does sound like the classic con, and no way can he or Nigel Searle be surprised at public response!

The last point I would like to make to Mr. Hedges concerns independence from Sinclair. Keep it. An independent user group is a good tool for keeping a manufacturer closer to the straight and narrow. One dependent on that manufacturer does no-one any favours.

Now, about that mystery machine, the QL (incidentally, mine should be in my eager, grasping paws by late July). The theories about it being intended as a business machine concern me. In its initial form it is not particularly useful as one. Psion's software may be wonderful and the Microdrives masterpieces of engineering, but no computer with the capacity to back up less than its own RAM capacity (remember, one Microdrive will be holding the software currently being run - Abacus, Easel or whatever) is not going to be taken very seriously. And the Winchester is a joke! Hard disks do occasionally go wrong, and I for one don't fancy recreating one from a two foot stack of Microdrive wafers. Of course, Sir Clive (Uncle Sir Clive, Sir Uncle Clive?) might be relying on the 'hangers on' to produce a floppy interface, if so then that is all very well, but seems a bit of a risk.

On the other hand, give credit where it is due, the QL does seem to be a superb machine, and it will warm the hearts of many thousands if it performs up to spec.

I have just read that I will be the owner of an RS-232 interface cable because my machine won't be delivered within the 28 days. That seems a bit much - or little, to me. I don't know what the interest on £442.95 is over five months (if I had a QL I could work it out, of course - which sounds self-defeating and perhaps even incestuous!) but I know it will be a good deal more than the manufacturing costs of an RS-232 cable.

Be the way, when can we expect you to produce a 68000 assembler for the QL? A Unix friend at work tells me that hand-assembling 68000 machine code gives you a headache after about six instructions!

Paul Wilson,
107 Bollington Road,
Bollington,
Macclesfield,
Cheshire SK10 5EL.

/* A comprehensive assembler for the MC68000 is quite a big undertaking. Sinclair will be bringing theirs out in the fullness of time, of course. The source code of a cross-assembler written in C is available from a guy in the States, for \$750. This could, in theory, be compiled using a suitable C compiler (on a Unix system, perhaps) to produce a version that would run on the QL. This would not take a great deal of work, and is probably what Sinclair, or the software house they have commissioned, is doing anyway. I might have a go at incorporating a simple line-by-line assembler in my monitor for the QL. One of our members has written a simple cross-assembler for the MC68000 in BBC BASIC that he will get running on the QL quite soon. */

FIRST IMPRESSIONS OF THE QL!

Having just come from the ZX Microfair, where there were some pre-production QLs on demonstration, I thought that I would share some observations with others in the Group.

First, as most of you will probably know by now, Sinclair Research Ltd. were having problems fitting everything into the planned 32K ROM, hence the big delay. They decided to send out the machines anyway with the overflow code in a ROM plugged into the ROM expansion port at the back. At the demonstration, the extra ROM on one of the machines was clearly labelled '\$8000-\$845A, so it appears that the ROM will use approximately 48K in total. At some future date (one of the programmers yclept John, said June. Believe it if you wish.) Sinclair Research Ltd. will be recalling your machines and installing their final version of the ROM inside the machine. so freeing the (now 16K) cartridge port. This upgrade should take about 10 days (said John).

There was quite a crowd there, but I did get some clarification of various points I had been curious about:

1. Speed of the BASIC

I saw the program below run, using the internal clock to do a benchmark timing:

```
100 LET a=date
120 FOR t=1 to 3000
130 END FOR
140 PRINT date-a
```

which printed a time of 64 seconds. This seems to be the equivalent of the PCW benchmark 1 timing of a FOR-NEXT loop, which PCW repeat for 100 loops, so this is roughly a PCW benchmark 1 timing of 2.1 seconds (compared to the BBC computer timing of 1.0 seconds and the Sinclair Spectrum timing of 4.8 seconds - PCW Vol. 5 No. 12, Dec. '83),

2. The editor in BASIC

This is very similar to the Spectrum and ZX81 editors in its operation, the line number being supplied as the parameter to the EDIT command. The lines are parsed for syntax errors on being listed and on being loaded from the Microdrive so (said John) there should be no real trouble in using Quill to do extensive editing of large programs, except that the text justification might do strange things.

3. Real time clock

There is no battery back-up to power the clock when the machine is unplugged, so the time and date have to be reset on power-up. It appears to hold the number of seconds after some base date in 1964 or '65, but PRINT date\$ gives a nice time, day, month and year display.

4. Function keys

These cannot be used to store and recall strings as on the BBC computer, but (you've guessed it) John said they're working on it.

5. Multi-tasking

Yes, it really does run up to 20 programs at once! BUT they have to be machine code programs called by the EXEC command. All is not lost, though, John said they're working on multi-tasking BASIC programs - at the moment only one BASIC program can be held in RAM at any one time.

6. Keyboard

Nice feel. Much quieter than the BBC keyboard and more responsive than a VT100 terminal keyboard, but having to press 'CONTROL' and 'LEFT CURSOR' to delete a character? Well - call it a feature!

7. Display

The display I saw was on a monitor (no, I can't remember what make it was). The characters were very clear even at 80 characters per line and the colours were sharp and bright. There are a standard eight colours at low res. mode and four at high res. per pixel. A very ,acceptable yellow can be obtained in high res. mode by using a stippled checker-board pattern of green and red pixels. In this way 256 combinations of the two colours chosen and four stipple patterns could be obtained easily by giving the PAPER command.

The flash is hardware controlled, so its rate cannot be altered.

The FILL command controls whether or not the figures drawn on the screen are filled in or not, and is very fast.

Windows on the screen are defined as a channel number giving top left co-ordinate and x and y size. If a figure is drawn within a window so that part of it goes outside then the part that is outside is not displayed and no error messages occur.

There are pre-defined figures, the only one I saw working was the ELLIPSE command which, surprise, surprise, draws an ellipse.

8. Calls to machine code

Parameters in the call can be passed directly to the MC68008 registers! There is intelligent life on Earth!

John said nothing when I started asking about routines in the ROM - are they going to be cagey in releasing information on this, or is there just a lot of the ROM yet to be finalised?

By the way, as it appears that they will still be making changes up until the June (?) upgrade, I would be wary of books claiming to be the definitive guide to QL machine code routines until then.

9. File handling

John didn't seem too clear on the QDOS commands (I suspect he wrote the Graphics commands as he took great delight in running a program which made pretty patterns using the ELLIPSE command). He thought we would have only the standard Open, Close, Read and Write, with maybe some sort of Append, and he said something about reading and writing to the same file at the same time that was drowned out by a Dalek-like voice synthesiser in the stall behind us.

The speed of loading of files from the Microdrives is faster than cassette and slower than floppies (John says they're working on improving the speed).

10. Sound

One channel. Louder than the Spectrum, but no simple way of taking the signal out and amplifying it. No software volume control. No hardware volume control. (Put a sock over it?).

John made some pleasing warbles. chirps and buzzes by plugging random numbers into the BEEP command. If you want more than this. wait until the sound expansion unit comes out (John said).

The sound is controlled and generated by the second processor, so it keeps coming as your program is running until its duration expires or another BEEP command is given.

11. The 1/2 Megabyte expansion unit is currently in prototype form (said John), so think of a date, add your mother's age. halve it and wait...

May I express my gratitude to John for his patience, and to anyone who can send me a hex dump of the 68000 series assembler, I will express anything!

Gary Williams,
18 Ilmington Road,
Kenton,
Harrow,
Middx.

WANTED

Reasonably cheap dot matrix, thermal, coloured, pen, plotter, printer with serial RS-232 interface to suit Newbrain micro. Mainly for listings, editorials for newsletter, etc.

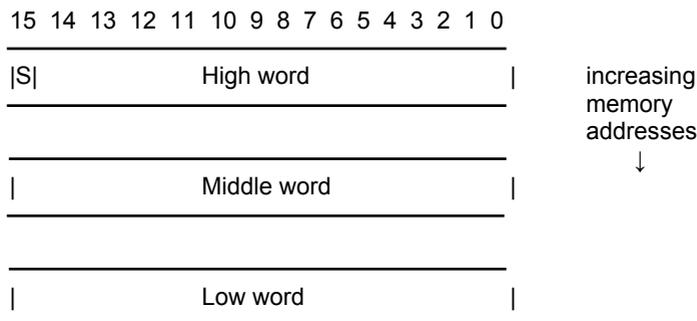
Mr. F. Hill,
24 Mount St. James,
Blackburn.
Lancs. BB1 2DR.
Tel: 662414 (Work)
57873 (Home)

MC68000 SIGNED 48 x 48 BIT MULTIPLY

AUTHOR: Rob Sherratt
DATE: 30th April 1984
VERSION: 1.0

DESCRIPTION

Multiplies 2 signed 48 bit binary numbers and produces a signed 96 bit product. On entry, register A0 is assumed to contain the address of 3 consecutive words in memory, which contain NUMBER 1 in the form:



Register A1 is assumed to contain the address of a similarly formed number, NUMBER 2. Register A6 must contain the address of 6 consecutive words in memory which is where RESULT will be stored once MUL48 has run. Note that the format of RESULT will be similar to that above except that there will be an additional 3 words allocated at the bottom of the block.

MUL48 works by performing a sequence of 9 16 x 16 bit multiplies, and the 32 bit products are judiciously added together with appropriate 16 bit shift and partial carry operations being performed before and after.

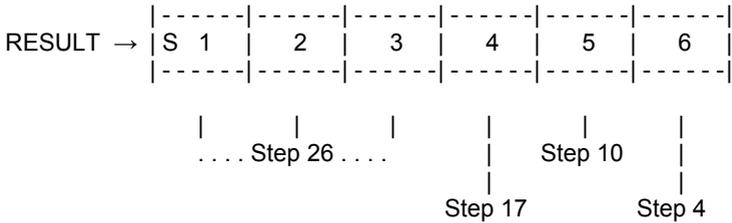
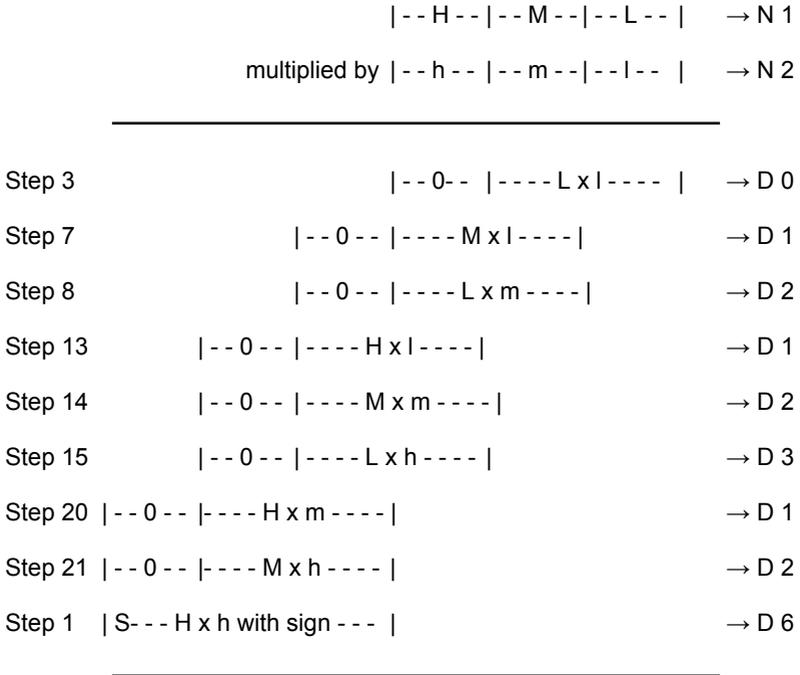
Represent NUMBER 1 by 3 16 bit words - H, K, and L

Represent NUMBER 2 by 3 16 bit words - h, m, and l

Represent RESULT by 6 16 bit words - 1, 2, 3, 4, 5, 6

Each of the numbers has the most significant bit of the high word (ie H, h, or 1) allocated as a sign bit which indicates the number is negative if the sign bit is set to 1. This is what the maths looks like:

DIAGRAM OF THE PARTIAL PRODUCT ADDITION TO FORM A 96 BIT RESULT



STEPS IN CALCULATING THE 96 BIT RESULT ABOVE

1. Using signed 16 bit multiply, calculate H h and store in D 6 for use later on, when all the partial products will be added.
2. Set sign bits in the H and h words to 0 for all successive multiplies, which will be done with unsigned arithmetic.

3. Calculate $L \times l$ and store the 32 bit result in D 0.
4. Store the low word of D 0 as word 6 of RESULT.
5. Set the low word of D 0 to 0.
6. Swap high and low words of D 0.
7. Calculate $M \times l$ and store in D 1.
8. Calculate $L \times m$ and store in D 2.
9. Add together the low words of D 0, D 1 and D 2, and store the 32 bit result in D 0.
10. Store the low word of D 0 as word 5 of RESULT.
11. Set the low words of D 0, D 1 and D 2 to 0.
12. Swap high and low words of D 0, D 1 and D 2, then add all three registers together, and store the 32 bit result in D 0.
13. Calculate $H \times l$ and store in D 1.
14. Calculate $M \times m$ and store in D 2.
15. Calculate $L \times h$ and store in D 3.
16. Add together the low words of D 0, D 1, D 2 and D 3, and store the 32 bit result in D 0.
17. Store the low word of D 0 as word 4 of RESULT.
18. Set the low words of D 0, D 1, D 2 and D 3 to 0.
19. Swap high and low words of D 0, D 1, D 2 and D 3, then add all 4 registers together, and store the 32 bit result in D 0.
20. Calculate $H \times m$ and store in D 1.
21. Calculate $M \times h$ and store in D 2.
22. Add together the low words of D 0, D 1 and D 2, and store the 32 bit result in D 0.
23. Store the low word of D 0 as word 3 of RESULT.
24. Set the low words of D 0, D 1 and D 2 to 0.
25. Swap high and low words of D 0, D 1, and D 2.
26. Add together, using 32 bit arithmetic, D 0, D 1, D 2 and D 6 (which was stored in step 1 above). Store the 32 bit result as words 2 and 1 of RESULT. The sign bit will be correctly set from step 1.

SUMMARY OF ENTRY AND EXIT PARAMETERS

On entry to MUL48, the following address registers must contain valid RAM addresses which correspond to the storage locations of 3 numbers as follows:

A 0 contains address of NUMBER 1 (3 consecutive words in memory)

A 1 contains address of NUMBER 2 (3 consecutive words in memory)

A 6 contains address for RESULT (6 consecutive words in memory)

MUL48 preserves all other registers (ie D 0 to D 7, A 2 to A 5 and A 7). The assembled code is reentrant (it uses registers and stack for any temporary storage) and position independent. 89 words of program memory space and 15 words (30 bytes) of stack space are used.

At a clock rate of 8Mhz, the subroutine takes $1808 * 125 \text{ ns} = 226 \text{ us}$ maximum time to perform a 48 x 48 bit signed multiply giving a 96 bit product. In the listing of the program which follows soon, the number of machine cycles each instruction takes to execute on a 68008 processor is given in the column labelled "C", and the number of code words generated by each instruction is given in the column labelled "W".

NOW THE PROGRAM MUL48 ITSELF

The next enthralling episode will be published in next month's QUANTA. Hopefully by that time I will have managed to get my hands on an assembler and a system containing a 68008, so I can prove the program works!

SINCLAIR AUTHORISE US TO PUBLISH ROM DISASSEMBLY

I have received a letter from Mr. W. Hatty of Sinclair Research Ltd., giving us permission to publish disassembled source listings of the QL ROM, subject to certain conditions I suggested in my original letter to them, and provided we print a copyright acknowledgment.

They also wish us success with the Newsletter, which they are unable to endorse or approve.

Leon Heller

Conversion of a 16in Grundig Colour TV to RGB operation.

by Andrew Donald

I have been reluctant to buy a colour monitor for my microcomputer as it has always seemed a very reasonable proposition to convert a colour TV to RGB operation.

The Grundig 16in Super Color A - Series F3016, was being offered by Boots as an end of line sale for £299, complete with infra red remote control and teletext. An added and unexpected bonus was the inclusion of a complete set of wiring diagrams. This seemed to be an opportunity to try an RGB conversion. It has proved very successful and has been used a great deal in its dual roles ever since.

Before describing the modifications which I made, I must stress that this type of conversion should not be attempted by anyone unless they are fully familiar with the inside of a TV. The extra high voltage line of this set runs at 22,500 volts. Unless you know what this line looks like, and how to avoid it - keep out. It is not worth the price of a colour monitor to end up very flat on the opposite wall.

The Conversion

First isolation from the mains is required. This I achieved by fitting a toroidal isolation transformer. Looking from the back of the set, there is a space between the case and the left-hand side of the chassis which comfortably accommodates the transformer. It should be connected on the set side of the main on/off switch and fixed securely in position. Disconnect the two wires running from the main switch and solder them to the output wires of the transformer making sure they are well insulated. The two transformer input wires now go into the main switch.

When this is completed, try the set to ensure all is still working properly.

What this has done is to float the 240 volts potential of the set and it can be relocated to the same zero volt base as the micro simply by connecting ground on the set (the chassis), to ground on the micro. Just to reassure myself that all was well at this stage, I made the connection and then tried both the TV and micro. There was no flash or smell of frying chips so I assumed this stage was operating satisfactorily.

The next problem was to access the RGB. Looking at the circuit I decided that, since the teletext uses RGB directly, all I needed to do was to replace its signal with the RGB from the computer. This really does make the operation very simple. The usual problem is to ensure that all the TV's IF circuitry is disabled whilst operating as a monitor. Since teletext has already taken care of this aspect we are able to feed computer RGB straight to the RGB amplifiers.

The teletext RGB comes out of the decoder board at pins 22, 23 and 24 of IC 2875, (SAA 5050), before being fed to amplifying transistors. Fortunately this connection is made via a four conductor strip over the top of the main chassis board. The RGB outputs run from the chip to edge pins 11, 12 and 13 of the teletext decoder board. Follow these to find the four conductor ribbon. I unsoldered the three lines at the end adjacent to the decoder board and a piece of similar conductor was soldered into the holes.

The original strip now gave access to the RGB amplifiers and the new strip was carrying the teletext. All that was now required was a switching arrangement to change between teletext and computer input to the amplifiers. I should point out at this stage that there is a slight problem here. The teletext RGB is at analogue levels (0-2 volts) whilst computer RGB is at TTL levels (0-5 volts). This I overcame by putting the Pi attenuator, resistor network shown in Fig.1, on each of the computer lines bringing it down to analogue levels. I found it convenient to position these resistors in the computer rather than in the TV but as long as the lines are attenuated to match impedance and voltages, it really doesn't matter where they are positioned.

After some deliberation over the point, I decided that relay switching of the RGB was a simple and adequate method although solid state switching might be more aesthetically pleasing. This TV uses a relay for stand-by mode, so a relay operating voltage is readily available. I used a four pole changeover relay with a 19v coil. A suitable diode to prevent back emf should be fitted across the coil. The fourth pole is required for the computer sync line.

The three lines to the RGB amplifiers are connected to the centre connections of three of the relay switches. The RGB from the teletext goes to the normally closed side of each changeover, and the attenuated RGB from the computer goes to the normally open side. The TV will now work normally whilst the relay is inactive and will switch over to computer RGB when the relay is activated. In wiring up these sections, well separated conductors should be used. There is a tendency for signals to be passed by induction if the conductors are too close. Similarly it is advisable to use good quality four core cable with individual shielding on the conductors, for the RG19 connection from the computer to the TV. The shielding may be used for the connection of the TV ground to the computer ground.

Now for the sync. The TV in teletext mode derives its sync from the transmitted UHF picture signal. When displaying computer RGB the required sync is not related to the picture signal at all. A simple way to provide sync is to connect the computer's UHF output into the TV aerial socket. The decoder will then pull out the correct sync and lock the RGB picture automatically.

Not liking the Idea of connecting the computer by two cables I used a different approach. I wanted to make the monitor selection as simple as possible, without the need to plug and unplug the aerial. This TV has an audio visual channel which is intended for use with a video recorder. Since I had no intention of using a video recorder, I thought I would use that channel for monitor operation. This had two advantages. First, selection of this channel is detectable inside the set by a low appearing on pin 5 of IC 2315 (UAA 2001), this enables the relay to be activated from this pin. Secondly the channel may be detuned so there is no picture signal associated with it and the computer's sync fed in to replace it. This allows the decoders to do their stuff and lock the RGB picture. Because the relay is active only in this mode, switching the sync through the relay prevents it interfering with the normal picture.

This then is the arrangement which I operate. The schematic diagram is shown in fig. 2. I used a BC147 to switch the relay voltage on and off. The choice of transistor was entirely arbitrary, I had one and thought it would be up to the job. Its base is wired through a 22k resistor to pin 5 of IC 2315. The coil supply voltage comes from point M19 on the main chassis board. (Not to be confused with M'19). The sync line from the computer is wired to the normally open side of the fourth relay pole and the centre of this pole goes to the C CVS line; to be found at edge pin 19 of the teletext board.

To operate this system is now very simple. Using the infra red controller I select the AV channel. I switch off the sound; this is not used. The teletext mode is selected and the screen then displays good quality RGB output from the micro. It is also necessary to adjust brightness but this is usual when selecting a teletext mode. All this can be done from the other side of the room and I do not have to put the computer off if I wish to go back to News at Ten.

One other point worth mentioning is that the teletext board uses two 2114, 1k x 4 bit RAM chips to hold the teletext page. Once the TV is isolated it is perfectly feasible, with suitable circuitry, to access this RAM from the microcomputer and so download the computer programs available from page 700 of Ceefax.

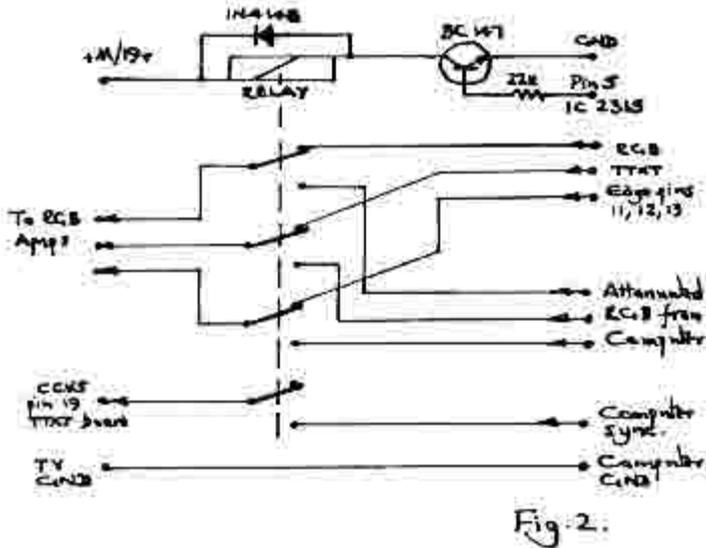
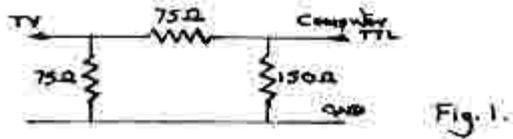
BOOK REVIEW - THE SINCLAIR QL COMPANION.

BY BORIS ALLAN

The tone of this book is set by the first two pages - both are taken up by a reproduction of the front cover with the reverse of the page blank. This excessive amount of 'Padding' is repeated throughout.

Neither Mr. Allan nor Pitman, the publishers, appear to have much faith in the accuracy or usefulness of the book, as the following disclaimer appears on the page containing the publisher's details:-

'The author and publishers cannot accept responsibility for any loss or any other inconvenience caused by failure of the material printed in this publication to correspond to the operation of the Sinclair QL computer or of its constituent parts.'



The first chapter, entitled 'Introduction to the QL', is in fact concerned with the structure of the books and says next to nothing about the QL.

Chapter 2, 'Building BASIC Structures' introduces the reader to QL SuperBASIC, by presenting a number guessing game program written in a common or garden variety of unstructured BASIC, and then showing the same game written in SuperBASIC. A discussion of the structured programming constructs in SuperBASIC follows, and the chapter concludes with an example of a bubble sort program. I could not get the program to work, when I tried it on a QL, as Mr. Allan has based his book on the provisional manual, and the BASIC is now considerably different.

SuperBASIC graphics are dealt with in Chapter 3, except that the last section of the chapter has about half a page on the BEEP command, with a program written for the Spectrums that one of our members has told me does not work on the QL!

Chapter 4 is very interesting. It contains several SuperBASIC procedures which allow turtle graphics à la LOGO to be simulated. Unfortunately, the QL now has turtle graphics commands built into SuperBASIC. I am told!

Chapter 5 deals with a few odds and ends of SuperBASIC syntax, and has some quite incomprehensible (to me, at any rate), sections. A typical one is:-

'Thus: some coercions are possible. and some are not. and whether the coercion is possible ultimately depends on the identifiers. This is a hierarchy of controlling factors which seems to run counter to the information factors.'

The 8049 single-chip computer which is used by the QL for most of the I/O functions is discussed in Chapter 6. Since the inner workings of this device are completely inaccessible to the user, I fail to see why this chapter has been included.

Chapter 7 is devoted to the MC68008 processor from a hardware point of view. and contains some real gems! For instance, Mr. Allan has a completely incorrect explanation of how a 'glitch' on the mains can result in the corruption of the memory contents. He presents a couple of diagrams describing the MC68008 bus cycle which tell the reader absolutely nothing. The author has obviously tried to summarise the Motorola documentation without understanding very much of it.

Chapter 8. the last chapter in the book. purports to deal with the MC68008 instruction set. Actually, quite a lot of the chapter is devoted to the MC6809, Z80 and 6502 processors! At the beginning, the author implies that he is going to develop an assembly language version of the SuperBASIC bubble sort program in Chapter 2, but he spends nearly four pages on how to swap two values using MC68008 instructions, and then forgets about the rest of the program. A table of MC68008 instructions is provided. and in the body of the text the author says that the more frequently used instructions are identified by an asterisk. I couldn't find a single asterisk!

The book finishes with a couple of appendices, each of which are preceded by a reproduction of the front cover, and a blank page, as at the beginning of the book.

The first appendix, headed BASIC comparisons, commences with the statement:-

'This Appendix is something of a cheat because in one sense there are no BASIC comparisons.'

He does not give any BASIC comparisons, anyway!

The second appendix consists of several pages of tables cribbed (with permission, however) from 'The 68000, Principles and Programming' by Leo Scanlon.

No index is provided, which is probably a sensible move on the part of the author, since it would highlight the paucity of real information contained in the book.

As you will have gathered, I do not think much of this book. and advise members not to buy it. As a review in one of the weeklies said about it, wait until you get your QL. and then get a book about it!

Leon Heller